

## ABSTRACT OF THE DISCLOSURE

Method and apparatus are provided for forming metal nitride (MN), wherein M is contacted with iodine vapor or hydrogen iodide (HI) vapor to form metal iodide (MI) and then contacting MI with ammonia to form the MN in a process of reduced or no toxicity. Such method is conducted in a reactor that is maintained at a pressure below one atmosphere for enhanced uniformity of gas flow and of MN product. The MN is then deposited on a substrate, on one or more seeds or it can self-nucleate on the walls of a growth chamber, to form high purity and uniform metal nitride material. The inventive MN material finds use in semiconductor materials, in nitride electronic devices, various color emitters, high power microwave sources and numerous other electronic applications.